

Adaptive Capacity of Dairy Farmers in Ziway-Shashemene Milkshed, Ethiopia

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Abstract: Ethiopia has the largest livestock population in Africa where cattle production is high. Among the cattle production, Dairy farming is a source of livelihood for many Ethiopians. Further, Dairy farming is crucial in providing income, food, and creating job opportunities for many people in Ethiopia. Understanding of dairy farmer's capabilities and capitals are important in order to achieve the desired life outcomes. Therefore, the study aimed to answer dairy farmers vulnerability context and Capitals/ assets that affects their adaptive capacity. The study was conducted in Ziway-Shashemene milk shed of Ethiopia where a descriptive research design was conducted where a case study was carried out to assess the adaptive capacity of farmers especially on their livelihood assets and factors affecting in the production of dairy farms through qualitative research methods. The study shows that dairy farmers face different challenges especially on feed unavailability, high feed price, milk and milk product price fluctuation, climate change, unavailability of land for pasture or planting forage, and disease and death of dairy cattle. In order to cope with those challenges they use various adaptive measures by using their indigenous knowledge and experience. However, Physical, financial, human, natural, and social capital of dairy farmers in the milk shed is limited, which is not enough to cope with vulnerability which negatively affects their adaptive capacity.

Keywords: Adaptive Capacity, Assets, Vulnerability

1. Introduction

Ethiopia has the largest livestock population in Africa. Among the livestock population, the cattle population in 2017 was estimated to be 60.39 million [1]. 70 per cent of the total population of Ethiopia fully and partially depends on cattle for their livelihood as a source of income, feed and a physical and financial asset. So it is important in eradicating and reducing poverty, and achieving food security [2, 3]. Furthermore, the country has a high potential for dairy development and 72 percent of the countries' milk is produced in a mixed crop-livestock system where the majority are smallholder farmers [4, 5]. Dairy farming is crucial in providing income, food, and creating job opportunities for many people in Ethiopia. However, the performance of the sector is low compared to its potential [6].

Adaptive capacity is the degree to which people have access to different "capitals" to achieve positive livelihood

outcomes that enable them to do different livelihood strategies. This approach helps in identifying farmer's ability and resources to pursue their livelihood outcome like resiliency that depends on the accessibility of resources [7]. The access to different resources and capitals that helps to adopt situations is therefore an essential aspect of resilience. Other studies by [8] define adaptive capacity of the system as "the capacity to learn, combine experience and knowledge, adjust responses to changing external drivers and internal processes, and continue operating". In the context of rural households, adaptive capacity can also be seen as adoption of new farming techniques, the diversification or adjustment of household's livelihood activities [9] and the decision of taking out loans or connecting to new social networks [10].

Adaptive capacity is all about resources or capitals needed practising successfully adapting to changes (Vulnerable Context). In order to achieve the desired life outcomes of individuals, communities and households, understanding of their capabilities and capitals are important [11]. Therefore,

the study was aimed to answer the vulnerability context of dairy farmers and their adaptive capacities.

2. Methodology

2.1. Description of the Study Area

The study was conducted in Ziway-Shashemene milk shed in Ethiopia that is located 160-273 south of the capital, Addis Ababa. The shed altitude lies between 1500 to 2600 m.a.s.l in the central rift valley of Ethiopia [12]. The farming system in the area is mixed crop and livestock production where livestock especially cattle has a crucial role. Cattles in this area are important since they provide drought, power and manure for soil fertility and fuel. Ziway, Arsinegele, Shashemene and Hawassa are towns located in the milk shed. The total estimated amount of milk produced annually along the shed is estimated to be 9.6 million litres where subsistence dairy farmers' milk produced is used for household consumption or traditional processing [8].

2.2. Research Design

A descriptive research design was conducted where a case study was carried out to assess the adaptive capacity of farmers, especially on their livelihood assets and factors affecting the production of dairy farms through qualitative research methods. The source of data to gather information for the study was from a primary and secondary source where semi-structured interview, focus group discussion and key informant interview, observation and desk research from relevant literature were used.

2.3. Sampling Procedures

Based on milk potential, Ziway-Hawassa milk shed was selected. From this area, dairy farmers were purposely selected as a sampling frame. The dairy farmers then were stratified into strata with similar characteristics like sex and age. A total of 24 dairy farmers, 8 key informant interviews and 5-group discussion were conducted.

2.3.1. Desk Research

Desk research was collected through a review of relevant literature from secondary data sources such as reports, journals, and books and credible online sources such as Google scholar, Greeni and other Internet sources.

2.3.2. Semi-structured Interview

Semi-structured interview for dairy farmers was conducted by using an open-ended interview questionnaire. This helps

to get information about key adaptive capacity of dairy farmers. Further, the interview finds out access to resources and services and vulnerability context of dairy farmers especially shocks, trends and seasonality at individual/household level. The sample size for the semi-structured interview was 24. The smaller sample size was selected since the study was qualitative research where in depth information was gathered. Further, due to the nature of the study, saturation of information also plays a vital role in choosing the sample size.

2.3.3. Focus Group Discussions (FGDs)

The focus group discussion was conducted in five rounds. For the purpose of getting extra information and validity of the data, the FGD participants were dairy farmers who were not selected for an interview. The first round FGDs participants were Male dairy farmers that consisted of both adult and youth whereas the second FGDs participants were young and adult Female dairy farmers. The third and fourth round of the FGDs were conducted after the semi-structured interview. The last FGD was done to validate and get extra information and review the preliminary result from the interview and FGDs.

Table 1. Number of participants in FGDs.

FGDs	Age		Total number of participants
	Youth	Adult	
FGD 1 (Men)	4	6	10
FGD 2 (Women)	3	5	8
FGD 3 (Men)	5	7	12
FGD 4 (Women)	3	4	7
FGD 5 (Both)	2	6	8

2.3.4. Key Informant Interviews

Interviewing relevant stakeholders who are involved in dairy and agricultural knowledge and information platforms was done through key informant interviews. The key informant for this research were representative of Adamitulu Research Centre, International livestock research institute forage seed multiplication, Two development agents (Arsinegele and Ziway), three agricultural office (Shashemene, Negele and Ziway livestock and fishery office) Alage ATVET, Oromia state University, NGO (SNV), District Energy office in total 9 institution or organisation that are involved in dairy sectors (see Table 2). The interview questions were a tailor-made checklist and additional information was asked during the interview.

Table 2. Key informant interviews.

Interviewees affiliation	Position of interviewee	Number of interviews
Adamitulu Research Centre	Dairy researchers team leader	1
District livestock and fishery office (Negele and Ziway, Shashemene)	Dairy expert and livestock and fishery department team leader	3
Farmer Training Center (Shashemene and Ziway)	Developmental agents	2
Alage TVET	Technology multiplication and transfer vice-dean	1
NGO (SNV)	Project coordinator in one district	1
	Total	8

2.3.5. Observation

The participatory observation was conducted to see resilient activities and practice in farms using observation checklists. Observation took place after the interview in cattle hubs or grazing lands to see the role, capitals (asset) and practice of dairy farmers/farming. It helped to triangulate and build validity the data obtained through semi-structured interviews.

2.4. Data Analysis

In this study, the data was coded and categorised by adaptive capacity and asset. Records from interviews, observations, and FGDs were organised and grouped to see patterns, trends and gaps to identify same information appearing in different places, check contradiction with different groups, methods, and see where information is

missing. After organising the data, key themes that summarise important groups were pinpointed and written. Asset (Capital) pentagons, sustainable livelihood framework and Harvard analytical tool were used to compare the capital women, men and youth endow and their accessibility and vulnerability and capability of dairy farmers. The interpretation of the analysed data helped to prove a point/view where alternative explanations for anything claimed to be true by the researcher was given. Further, the interpretation of the data was checked with other people to get their perspective and viewpoint that helped to improve the quality of the research. Finally, the data analysis was presented in a qualitative explanatory or narrative way. The study adopted the: Sustainable livelihood framework for both data collecting and analysing the collected data.

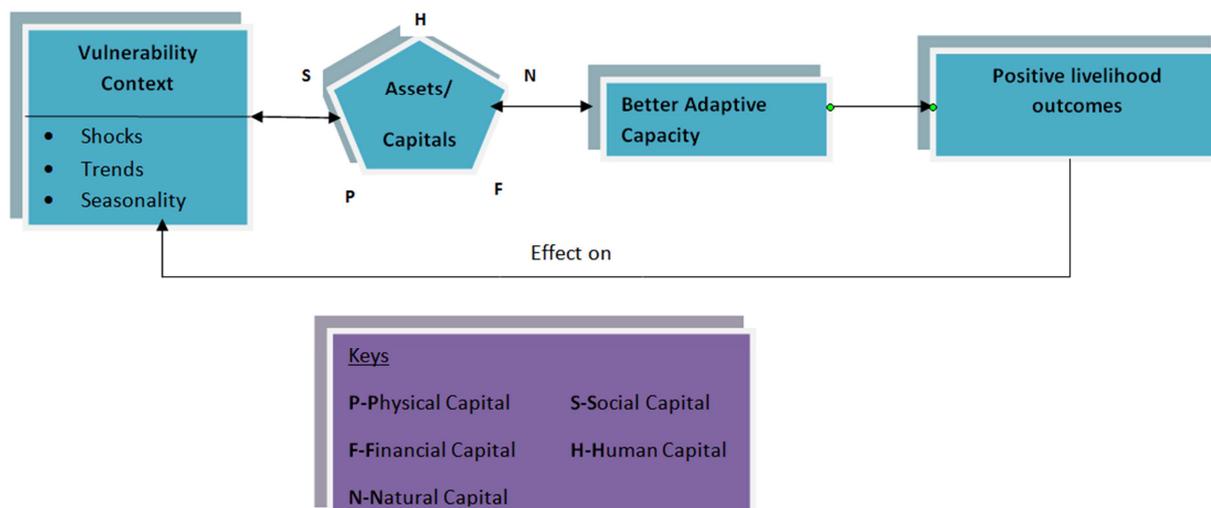


Figure 1. Adopted Sustainable Livelihood Framework.

3. Results and Discussion

In this chapter, findings from the field research are compared with research and literature done on similar topics of the study.

3.1. Vulnerability Context of Dairy Farmers

The study showed fasting seasons especially Orthodox Christian and religious festivals are the main factors for price fluctuation of milk and milk products in the study area. Other studies [12, 14-16] also indicated during the fasting time milk and milk product price declines while, during religious festivals, price for milk products especially price for butter and cheese increases. Fasting seasons and religious festivals have significance in the milk market since in Ethiopia more than 200 days in a year are fasting days. However, dairy farmers who had formal market linkage, especially farmers who sell their milk to the hotels do not encounter price fluctuation since the price is standard. However, their number is low.

Availability of feed resources and pastures for dairy has great importance in increasing milk production. This study shows most of the dairy farmers have limited pasture land or land for planting fodder to feed their cattle even if the price of feed is increasing over time. Concurring with this the main constraint in increasing milk production for dairy farmers are inadequate feed and increases in feed price. The study also shows limited land availability is also a factor for inadequate feed for dairy cattle [13, 17]. Further, feed prices, especially nougat cake and wheat bran, are increasing over time.

This study shows health-related challenges of dairy animals like Mastitis, Blackleg and Anthrax affect productivity of the dairy cattle. Prevalence of different cattle diseases affects dairy development through disturbing the productivity and reproductively efficiency of dairy cattle [18].

3.2. Adaptive Capacity of Dairy Farmers

For dairy farmers who do not have market access for fresh milk, processing and selling it to an informal market is an important adaptive capacity of farmers, especially for women dairy farmers. The study also shows the dairy farmers have

indigenous knowledge on how to process milk. Other studies indicated in livestock production, farmers have indigenous knowledge on dairy processing and preservation of milk [14].

Farmers in the study area have knowledge on the effect of hygiene on the health of dairy cattle. In the semi-structured interview, all respondents said they clean the cowshed every day. However, it is observed farmers have no proper housing without a concrete floor, so cleaning the shed is difficult. So, milking of the dairy cow is done in farmer resident compounds outside the cowshed. This concurs with the study done by [16].

Dairy farmers in the study keep dairy cows mainly for the purpose of milk and to use the bi-product for crop production. Manure from the dairy cattle is mostly used as fertiliser on farms. With mixed agricultural production, manure is applied to increase soil fertility and production of crops, which helps them to get both food for themselves and enough crop-residues. The findings also show some of the dairy farmers use dung cake as a source of fuel. Further, dung cake is used as a source of fuel, especially for preparing food [19].

3.3. Dairy Farmers Capital

The dairy farmer's assets (Capital) like Human, Physical, Social, Natural and Financial assets are analysed below.

3.3.1. Human Capital

Dairy Farmers have heterogeneous asset endowment in which each farmer has different assets. Dairy farmers have indigenous knowledge and skill that is gained through experiences and family. Labour force for most dairy farms is family labour in which women are more involved in activities like cleaning, milking, processing and retailing of milk and milk products. Similar studies done in Debremarkos, Ziway and Gojam of Ethiopia shows, men are involved in selling and breeding activities while youth, especially male children are involved in cattle keeping while women are involved in routine dairy activities like cleaning, milking and processing [20-22].

3.3.2. Physical Capital

Land endowment for women, men and youth have no much difference but in a semi-structured interview, women have less access to land especially due to culture for inheritance and decision-making power and land ownership are for men. This result is in line with the Report from GLTN, which showed men exclusively own and access land through inheritance [23]. The finding of this study also shows land used to develop improved animal feed and access to grazing land is the major constraint in dairy farmers.

In the farmer's interview and focus group discussion of men dairy farmers, it is revealed that dairy farmers possess cross breed cattle. However, during the focus group discussion of women, none of the participants owned crossbreeds. A survey done in the Central Statistical Agency (CSA) showed that 98.24 per cent of the total cattle of Ethiopia are local breeds [1].

Dairy farmers in this study do not keep their dairy cattle in

improved and proper housing where dung and urea are separable. This is similar to the study done by [24] where rural dairy farmers do not have proper feeding barns and improved housing. This is due to the capacity of dairy farmers to build a proper house, especially financial capacity.

3.3.3. Social Capital

In Ethiopia, cooperatives that are engaged in milk production and marketing consist only 0.74 per cent of the total number of agricultural and non-agricultural cooperatives [25]. This study also shows dairy farmers in the study area are not a member of a cooperative. Social capital for women dairy farmers is higher as compared to the men dairy farmers since they have more exposure and better organise to their neighbours, especially by participating in social organisation.

3.3.4. Natural Capital

Dairy farmers in the area have limited natural resources due to population increase and climate change which is different from the study done in Kenya where soil fertility and water bodies for dairy farmers is rich [26].

3.3.5. Financial Capital

The importance of the financial institutes in any agricultural production is undeniable. Traditional ways of saving like rotating savings provide financial support and social connection for farmers. An important finding is that women dairy farmers participate more in traditional social organisations like Edir and Equb. This is similar to the finding found in the literature where participation of women in Edir and Equb is high [27]. However, both Men and Women do not have credit access due to collateral issues. Further, land ownership is in the hand of Men, access to credit for women is also difficult. Further, dairy farmers have low financial capital to increase physical capital, especially proper cowshed and better breed cattle.

In the focus group discussion for validation of findings from the field, asset pentagon of the dairy farmers was drawn. The pentagon was drawn based on the findings presented and from farmers who were participating. According to it, both male and female natural capital, human capital, and social capital of the dairy is limited whereas the financial and physical asset of dairy farmers is very limited. However, male respondents had higher financial, physical and human capital as compared to females. In contrast, women had higher social capital as compared to male dairy farmers (see figure 1).

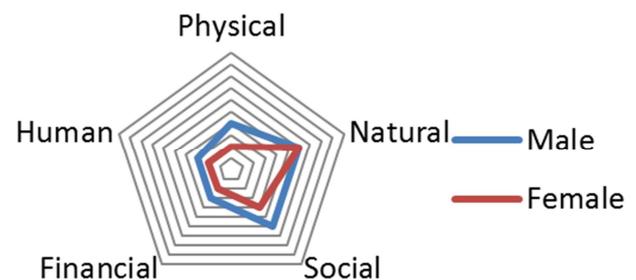


Figure 2. The asset pentagon of Male and Female Dairy Farmers.

4. Conclusion

The Vulnerability context of dairy farmer that affect the dairy farms in this study are feed unavailability, high feed price, milk and milk product price fluctuation especially during holidays and fasting time, climate change, unavailability of land for pasture or planting forage, and disease and death of dairy cattle.

Knowledge, experiences and information of dairy farmers that enables them to decrease vulnerability context and increase their adaptive capacity in the area were using other sources of feed like by-products, crop residues and grazing when they face feed unavailability. Value addition of milk to butter and cheese when there is no market for milk is also another skill of the dairy farmers. Further, in order to increase the soil fertility of their land, farmers use cow manure/dung as a fertiliser. Cattle manure is also used as a source of fuel for the households. Women dairy farmers build social connectedness through participating in social organisation that helps them to be resilient. The adaptive capacity of dairy farmers helps them to be resilient when they are facing vulnerability. Further, the adaptive capacity of dairy farmers depends on their asset endowment. However, some of the adaptive capacity of farmers might be due to the commitment of farmers to give time to cow management.

In conclusion, Physical, financial, human, natural, and social capital of women, men and youth in the milk shed is limited. However, the financial, human and physical capital of men is a little better than women and female dairy farmers have more social capital compared to the male dairy farmers. Due to all this, it is not easy for dairy farmers to cope with vulnerabilities and their adaptive capacity is low.

5. Recommendation

Despite its importance in improving the availability of feed for dairy farmers, Fodder production in the area is not well known or practised. Therefore, different stakeholders like research centres, developmental organisations and agricultural offices should work on creating awareness about the importance of forage production in order to increase productivity of milk.

Since the area has potential in dairy, the government should better encourage the private sector to launch dairy processing industries where smallholder farmers sell their small milk production and create market linkage throughout the year with an appropriate price.

Existing dairy cooperatives try to facilitate so that dairy farmers can access alternative protein rich feed sources like brewery spent grain for high production of milk.

Further research is recommended especially in capacitating the dairy farmer's indigenous knowledge, skill and experience for better livelihood.

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